Ideas for water management

LLB - PTTFM 2000

PORTABLE ULTRASONIC TRANSIT TIME FLOWMETER

Measurement, data acquisition and transmission system of flow and pressure for water networks with long battery life

With Long Life Battery Portable Transit Time Flowmeter 2000 (LLB-PTTFM2000) BM Tecnologie Industriali developed and introduced in Full Pipe Water Flow Measurement Market a revolutionary **ALL IN ONE** flowmeter.

LLB-PTTFM2000 is an ultrasonic flowmeter that uses both ultrasonic clamp-on sensors and insertion sensors, it has a rechargeable battery LiFePOH4 40 Ah lasting up to one year and can be powered by a fixed universal power supply too.

It acquires data on an internal 4 Mb memory (266,144 acquisitions) and on an external 4GB pen drive: the acquired data, together with the alarms and the diagnostics can be sent remotely through a built-in GSM / GPRS modem.

The IP67 protection grade of the main unit and the IP68 protection grade of the sensors complete the excellent performances of this flowmeter.

The advanced configuration menu can guide in a few steps, through a display and a keyboard or using software HydroFlux, even a few experienced operator about how to use LLB-PTTFM2000.

A sophisticated diagnostic system, with a smart user interface, allows the user to understand quickly if the measurement is correct and, if not, to identify the problems.

The software HydroFlux was developed for the advanced management of the acquired data, it allows the creation of master data, tables and graphs, it could be able to make the budget in a water district and identify the water losses, it imports and exports the data.

Main Characteristics

- ✓ Flow and Pressure measurement
- ✓ Protection IP67
- ✓ Battery life: up to 1 year, expandable
- ✓ Compact and easy to install
- ✓ Digital and analog input
- ✓ Data acquisition on internal memory and USB Pen Drive
- ✓ Data transmission via GPRS/GSM/SMS to a remote system
- ✓ Software "HydroFlux" for data management and configuration

Main Applications

- ✓ Virtual Water Districtualization
- ✓ Leak in Aqueduct
- ✓ Check Fire System
- ✓ Calibration of Numerical Models
- ✓ Measurement campaigns on Long and Short Periods in Aqueduct
- ✓ Water Balance
- ✓ Pumping Station Control
- ✓ Waste Water Treatment Plants
- ✓ Hydroelectric Power Stations
- ✓ Industrial Process Monitoring

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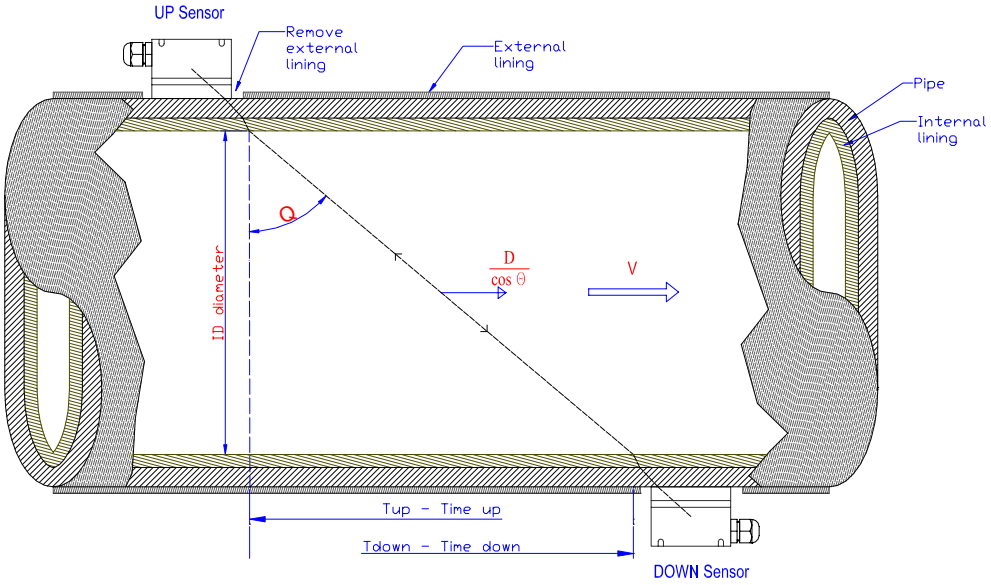
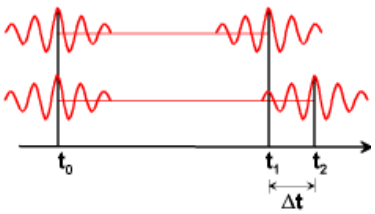
LLB - PTTFM 2000 — Working principle

The device measures flow rate by calculating the spreading time of an ultrasonic wave in a liquid, going upstream and downstream into a pipe.

When the ultrasonic wave spreads in a liquid, the flow will cause a changing in the spreading time depending on downstream or upstream current.
The ultrasonic wave going towards the same directions of the flow increases the spreading speed, while the ultrasonic wave going towards the opposite side of the flow decreases the spreading speed.
If the difference between the two spreading times is accurately measured, it would be possible to calculate the flow speed.



The measures are taken by 2 sensors in direct contact with the pipe's external surface. One sensor is placed on the upper side of the pipe's external surface (UP SENSOR), one sensor is placed on the lower side of the pipe's external surface (DOWN SENSOR). The sensors positions could look like a "Z" or like a "V" , a "N" or a "W", if the pipe has a small diameter (in the previous sketch, the sensors are "Z" mounted).
The difference between the transmitted and received signals upstream and downstream is calculated as follows:



$$(1)\ Tup = \frac{\frac{M * D}{COS\theta}}{Co + VSIN\theta} \qquad (2)\ Tdown = \frac{\frac{M * D}{COS\theta}}{Co - VSIN\theta}$$

$$(3)\ V = \frac{M * D}{SIN2\theta} * \frac{\Delta T}{Tup * Tdown}$$

Where:

M = Spreading time
D = Pipe's internal diameter
Θ = Pipe's internal diameter
Co = Sound spread speed through the fluid in static conditions
Tup = Positive spreading time
Tup = Negative spreading time

The Δt value is the difference of the spreading time into a homogenous fluid without gas bubbles.

The equation (3) for calculating the average speed "V" could be used for all the types of fluids in ideal working conditions. The fluid speed measuring is in fact conditioned by different factors which decrease the precision: for example the deposits on the inner walls of the pipes change the measuring principle of the transit time flow meter.

It is possible to adjust the zero point of the device: if the fluid is in static conditions, this operation makes the repeatability precision increase until reaching values near to 1%.

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LLB - PTTFM 2000 — Technical specifications

ELECTRONIC UNIT	
I/O	
Flow sensor inputs	Inputs for ultrasonic transit time sensors
Digitals Inputs	4 opto-isolated digital inputs 0-24V: - 1 alarm input - 1 totalizer input for external pulse flowmeter - 1 input for starting acquisition by external event - 1 input for direct transition from intermittent to continuous acquisition
Pressure sensor input	1 analog input 0÷10V
Serial port	RS232, RS485 ModBus
POWER SUPPLY	
Internal Battery	LiFePOH - 40Ah
Extern	Low tension: 11÷24V AC/DC High tension by AC/DC converter: 90..240V_{AC} ~ 60/50Hz
Consumption	Max in transmission: 150mA @ 13,2V Min. in low power 0,39mA @ 13,2V
ACQUISITION DATA MEMORY	
Flash	4 MB - 262144 records
USB Pen Drive	4GB
REAL TIME CLOCK	
Real Time Clock	Buffered with internal battery
MODEM and SIM CARD	
Bandwidth	QuadBand GSM: 900/1800 e 850/1900 MHz
Functions	SMS, GSM, GPRS
Standard	Compatible with controls AT standard 07.07 e 07.05
SIM Holder	External access
Antenna	Magnetic base, ominidirectional with 1,5 m cable
DISPLAY e KEYBOARD	
Number of characters	2 rows x 20 columns, Backlit with adjustable contrast
Menu languages	Italian e English (Chinese, German, French, Spanish, Portuguese under development)
No. of keys	12 alphanumeric keys, 8 function keys
ENVIRNMENTAL	
Temperature	-10°C ~ +50°C (14°F ~ 104°F)
Protection	IP67
MECHANICAL	
Case/Material	Black Case - PA66 loaded
Size and weight	L430 x P330 x H170 mm - 10 Kg (batteries included)
COMPLIANCE STANDARDS CE	
Compatibility / Electromagnetic Immunity	EN 61000-6-2: 2005

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LLB - PTTFM 2000 — Technical specifications

FLOW MEASUREMENT	
Performances	Accuracy: ±1.0% (after calibration) Linearity: 0.5% Ripeatability: ±0.2% ~ 0.5% m/s
PIPES	
Material	Carbon steel, INOX, cast iron, ductile iron, copper, PVC, aluminum, cement, fiberglass and most other materials. The flow can be measured on pipes with an inner lining by selecting the liner material and thickness in an appropriate menu.
Internal diameter	15…6000 mm
Hydraulic conditions	The upstream straight section must be greater than 10 diameters, the downstream section should be greater than 5 diameters
MEASURABLE FLUIDS	
Type	Drinking water, sea water, kerosene, gasoline, fuel oil, oil, propane -45 °C, butane 0 °C ... any liquid that is able to propagate ultrasound
Suspended solids	Up to 20000 ppm (mg/l) with a few air bubbles
Temperature	-20°C~ +80°C
ULTRASONIC TRANSIT-TIME SENSORS	
Type	**Clamp-on outside of pipes:** • TS2-NG-PTTFM2000 for DN15..100 mm • TM1-NG-PTTFM2000 for DN50..1000 mm • TL1-NG-PTTFM2000 for DN300..6000 mm Temperature: -20°C~ +80°C **Insertion type:** • B(45)-1-NG-1”-PTTFM2000 for DN50..6000 and pipe thickness up to 30 mm • B(45)-2-NG-1”-PTTFM2000 for DN50..6000 and pipe thickness up to 85 mm Temperature: -20°C~ +90°C- Max pressure: 20 Bar
Mounting methods	“N”, “W”: pipes DN≤32 mm "V": pipes DN40..600 mm "Z": pipes DN≥600 mm
Cable length	5 m extendable with 5 m extensions (Max. 200 m)
Protection	IP68
MEASURING UNITS	
Metric	m^3, l, USGal, UKGal, milioniUSGal, cubic feet, barrels oil US, barrels oil UK / sec, min, hours, days

PRESSURE MEASUREMENT	
Nominal Range	0..0,10 - 0,25 - 0,40 - 0,60 - 1,00 - 1,60 - 0..2,50 - 4,00 - 6,00 - 10,0 - 16,0 - 25,0 - 40,0 - 60,0 - 100,0 Bar (user selectable)
Accuracy	0,5% with a range up to 0,6 Bar - 0,35 % with a range over 0,6 Bar
Temperature	-25°C~ +125°C
Protection	IP68
Cable length	5 m (incremental length at step of 5 m) - Max. 200 m
Measuring unit	Bar, PSI

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LLB - PTTFM 2000 — Mechanical Features

BASIC EQUIPMENT LLB-PTTFM 2000		
Quantity	**Description**	**Code**
1	Transit time flowmeter, type: **LLB-PTTFM2000** Rechargeable Batteries 40 Ah – USB Case - RS232 - Modem GSM/GPRS – Internal memory 262144 records - 1 analog input - 4 digital inputs	000033799
1	Couple of clamp-on transit time sensors, type: **TS2-NG-PTTFM2000** For pipes DN15..100 - Temp. Max.: 80°C – Velocity Range: $^{+}$/- 16 m/sec With outgoing cable (0,25 m) and rapid connector IP68	000033779
1	Couple of clamp-on transit time sensors, type: **TM1-NG-PTTFM2000** For pipes DN50..1000 - Temp. Max.: 80°C – Velocity Range: $^{+}$/- 16 m/sec With outgoing cable (0,25 m) and quick connectors IP68	000033780
1	Couple of spiral cables for PTTFM2000 sensors, type: **2/SPIREX-STD-UP/DOWN-PTTFM2000** Extension: Min.:1650 mm; Max.:5000 mm; complete with quick connectors IP68	000033831
1	Serial cable RS232, type: **CS232-2,5-PTTFM2000** Complete with quick connectors IP68- Length: 2,5 m	000033795
1	Pack of acoustic coupling gel, type: **TGA-TTFM**	000028162
1	Kit chains for fast mounting of clamp-on sensors, type: **CMS-CLAMP-1000-PTTFM2000** For pipes up to 1 m diameter	000025749
1	Junction Box for external power supply and battery charger, type: **JB-220/24-PTTFM2000** Complete with quick connectors – Cable length: 2 m	000033839
1	Switching adjustable power supply, type: **LLAS-1000-PTTFM2000** With plug connector for Junction Box	000033702
1	Battery Charger for LLB-PTTFM2000, type: **BCH-40AH-PTTFM2000** Input: 110-240V_{AC} with connector for Junction Box	000033287
1	USB Pen Drive case, IP68, type: **CPD-USB-PTTFM2000** Material: Black PVC - 2 m outgoing cable with connector IP68 Complete with USB Pen Drive: 4GB	000033797
1	Waterproof Paper roll for "Z" type mounting of clamp-on sensors, type: **RC-20-"Z"** Weight: 0,3 Kg - Height: 0,3 m - Length: 20 m	000031086
1	Antenna GSM 900/1800, magnetic base, type: **ABM-1,5-PTTFM2000** With 1,5 m cable and IP68 connector	000033798
1	Dehumidification system in silica gel, type: **SD-PTTFM2000**	000033821
1	USB/RS232 converter, type: **IDATA USB-SER-2** With 450mm cable length	000033947

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1	Tape roll, type: **MTR-3,5-AV** Length: 3500 mm	000033962
1	Universal adapter for plugs, type: **SWA001**	000030366
1	Configuration and data management Software: "**HydroFlux**"	000033867
1	User manual	000033868

PRESSURE SENSOR LLB-PTTFM 2000	
Description	**Code**
Piezoresistive pressure transmitter, type: **TPR 331-xxxx-005-PTTFM2000** 0..0,10 Bar	000033800
0..0,25 Bar	000033801
0..0,40 Bar	000033802
0..0,60 Bar	000033803
0..1,00 Bar	000033804
0..1,60 Bar	000033805
0..2,50 Bar	000033806
0..4,00 Bar	000033807
0..6,00 Bar	000033808
0..10,0 Bar	000033809
0..16,0 Bar	000033810
0..25,0 Bar	000033811
0..40,0 Bar	000033812
0..60,0 Bar	000033813
0..100,0 Bar	000033814

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ACCESSORIES FOR LLB-PTTFM 2000	
Description	**Code**
External battery for LLB-PTTFM2000, type: **EPB-40Ah-PTTFM2000** Protection IP67 – Capacity: 40 Ah	000033785
External battery for LLB-PTTFM2000, type:: **EPB-80Ah-PTTFM2000** Protection IP67 – Capacity: 80 Ah	000033786
External modem, Dual Band GPRS Cinterion, type: **TC35i** With magnetic antenna, $230V_{AC}/12V_{DC}$ -1000mA power supply and converter RS232/USB	000028429
Rail guide mounting system in stainless steel for clamp-on sensors installation: **RGMS-TS2/TM1-NG-FIX** For pipes DN15…DN250	000031466
Couples of rail guide mounting system in stainless steel for clamp-on sensors installation: **RGMS-TS2/TM1-NG-FIX-2** For pipes > DN250	000033869
Couple of spiral cables for PTTF2000 sensors, type: **2/SPIREX-PRL-UP/DOWN-PTTFM2000** Length: 5000 mm; with connectors IP68	000033833
Junction Box for external digital inputs PTTFM2000, type: **JB-4DI-PTTFM2000** With 2 mt cable connector	000033870
Kit of mounting chains for clamp-on sensors installation, type: **CMS-CLAMP-3000-PTTFM2000** For pipes up to 3 mt diameter	000033871
Kit of mounting chains for clamp-on sensors installation, type: **CMS-CLAMP-6000-PTTFM2000** For pipes up to 6 mt diameter	000033872

SPARE PARTS FOR LLB-PTTFM 2000	
Description	**Code**
Absorbent Micro filter with silica gel, type: **MFGS-PTTFM2000**	000031923
USB Pen Drive, type: **PM4G-USB-PTTFM2000** Capacity: 4 GB	000033492
USB Pen Drive holder IP68: **MCPD-USB**	000033661

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LLB - PTTFM 2000

Ordering Code

ORDERING CODE LLB-PTTFM 2000

LLB - PTTFM 2000 1 _ _ - 1 1 _ _ _ - _ _ - _ - _ _ - _ _ - _ - _ - _

Data transmission	
USB Pen Drive **(series)**	1
BlueTooth (not yet available)	1
WI-Fi (not yet available)	1
FLOW SENSOR	
Clamp-on: TS2-PTTFM 2000 **(series)**	1
Clamp-on: TM1-PTTFM 2000 **(series)**	1
Clamp-on: TL1-PTTFM 2000	1
Insertion: B(45)-1-NG-1”-PTTFM2000	1
Insertion: B(45)-1-NG-1”-PTTFM2000	1
CABLE LENGHT FOR FLOW SENSOR	
5 m **(series)**	0 0
Indicate the number of 5 m extensions	
RAIL GUIDE FOR FLOW SENSORS	
No	0
Single for DN15…DN300	1
Pair for DN15…DN600	2
PRESSURE SENSOR	
0..0,10 Bar	0 1
0..0,25 Bar	0 2
0..0,40 Bar	0 3
0..0,60 Bar	0 4
0..1,0 Bar	0 5
0..1,6 Bar	0 6
0..2,5 Bar	0 7
0..4,0 Bar	0 8
0..6,0 Bar	0 9
0..10 Bar	1 0
0..16 Bar	1 1
0..25 Bar	1 2
0..40 Bar	1 3
0..60 Bar	1 4
0..100 Bar	1 5
CABLE LENGHT FOR PRESSURE SENS.	
5 m **(series)**	0 0
Indicate the number of 5 m extensions	
ANTENNA	
1,5 m cable **(series)**	1
5 m cable	2
10 m cable	3
15 m cable	4
JUNCTION BOX FOR DIGITAL INPUT	
No	0
Yes	1
CHAINS KIT FOR CLAMP-ON SENSOR	
For diameter up to 1 m	1
For diameter up to 3 m	2
For diameter up to 6 m	3

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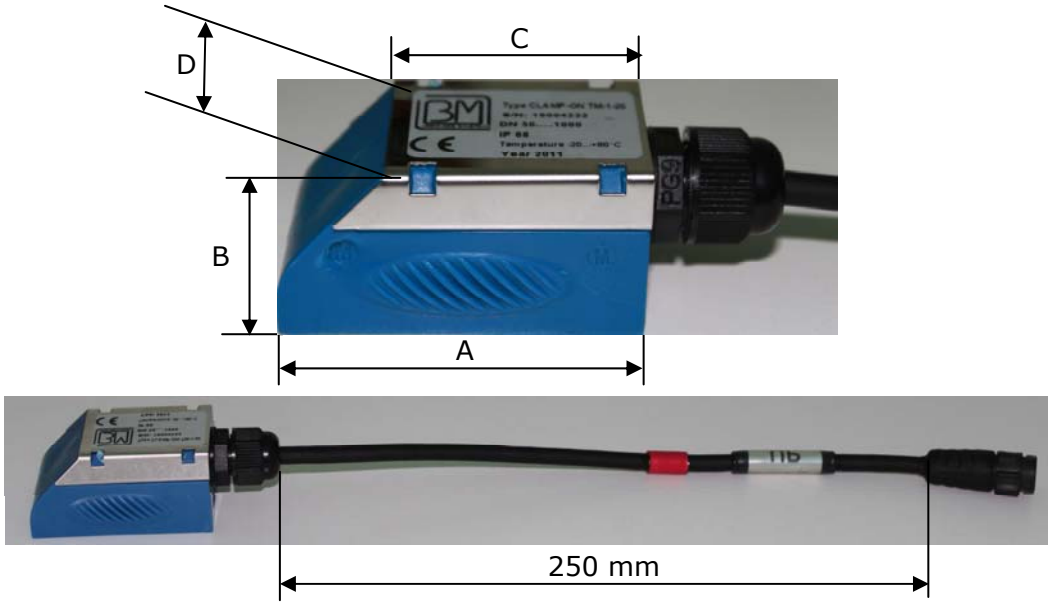
LLB - PTTFM 2000

Mechanical Features

LLB-PTTFM 2000

CLAMP-ON SENSOR



Sensore	A	B	C	D
TS2-NG-PTTFM 2000	45 mm	24 mm	27 mm	28 mm
TM1-NG-PTTFM 2000	64 mm	33 mm	45 mm	39 mm
TL1-NG-PTTFM 2000	98 mm	46 mm	68 mm	52 mm

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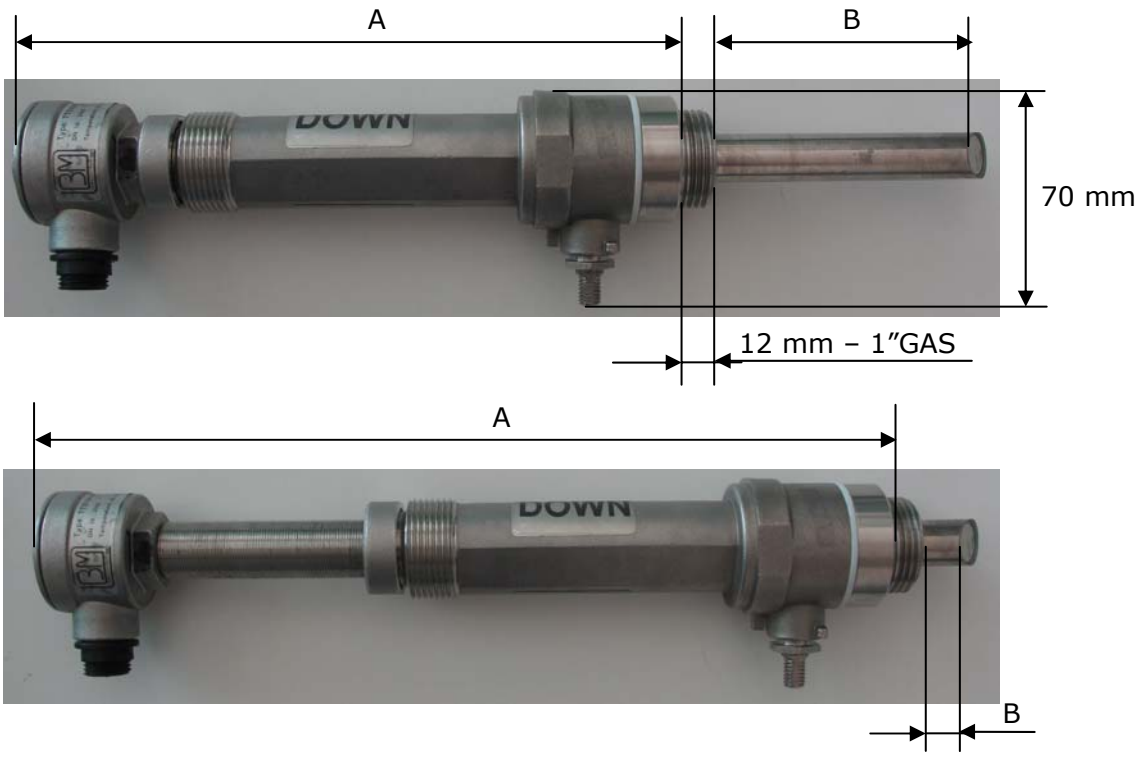
INSERTION SENSOR



Sensor	Insertion	A	B
B(45)-1-NG-1"-PTTFM2000	Minimum	160 mm	8 mm
	Maximum	137 mm	30 mm
B(45)-2-NG-1"-PTTFM2000	Minimum	295 mm	8 mm
	Maximum	220 mm	85 mm

PRESSURE SENSOR

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HydroFlux

Software to manage the data downloaded from LLB-PTTFM 2000

Data display tabular and graphical form

Water balance for leaks detection

Software

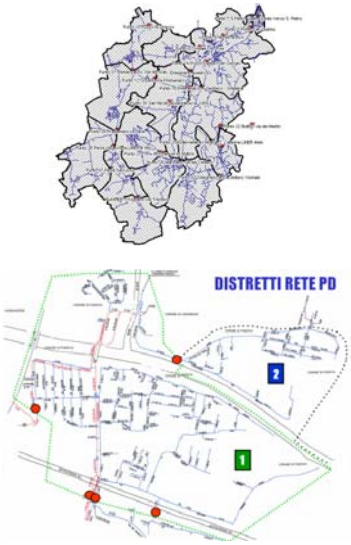
General description

HydroFlux is a software developed for the configuration, the download and the import of data from LLB-PTTFM2000 and their following automatic analysis to detect, for example, the losses in a water network.

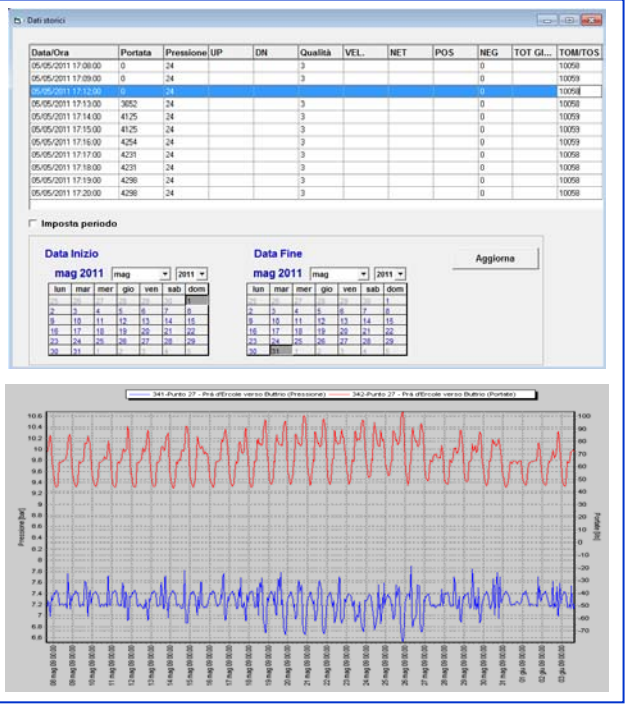
You can create measurement stations to which bind the data downloaded from an LLB-PTTFM2000 and build virtual water districts that can be identified by some stations.

The advanced processing and management of ingoing and outgoing flow data of the water districts identifies any losses in water networks by measuring the minimum night flow. It is possible to display the data in tabular or graphical form, for an immediate visualization of trends.

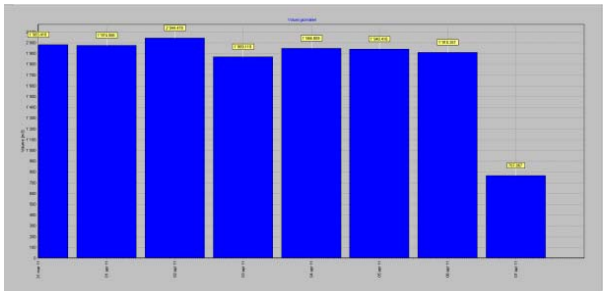
Districts organization



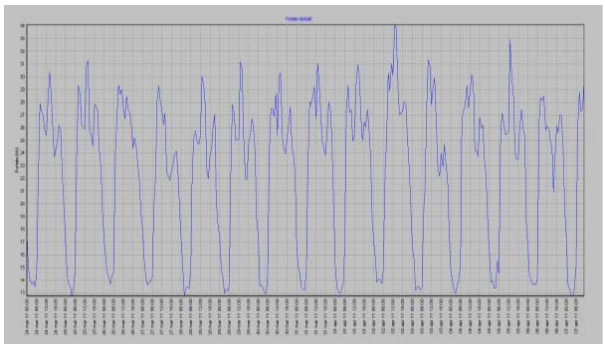
Data visualization



Volumes



Minimum Night Flow



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Ideas for water management

ULTRASONIC TRANSIT TIME FLOWMETERS
TTFM100-NG SERIES

The Transit Time Flow Meter of TTFM100 NEW GENERATION (NG) series measures flow rate by calculating the spreading time of an ultrasonic wave in a liquid, going upstream and downstream into a pipe.
This flow meter is mostly used to measure the flow rate of homogeneous fluids, also with a **quite high percentage of suspended solids.**
The measuring system is composed of a couple of ultrasonic transducers acoustically coupled to the external pipe's wall (it is also possible to use transducers in direct contact with fluid to be measured - called wetted sensors) and a HOST unit elaborating the signal that are sent and received from the transducers.
The HOST unit has a DSP microprocessor, it gives signals for **interfacing with the process or the control systems.**

Main Features

The TTFM100-NG series includes a range of flow meters whose electronics is composed of a single board: high precision, high fidelity, high competitivity.
The main features are:

- Clamp-on sensors: it is not necessary to stop the flow to install them;
- Wetted sensors.
- AC and DC supply: 110-230VAC and 12-36VDC; battery supply, depending from the type of device. LLB-PTTFM2000-NG can be supplied by solar panel too.
- The time difference during the measuring process could be 0.2 ns.
- Analog (4-20 ma), pulses (relays), frequence (OCT) and RS485 MODBUS or RS232 outputs.
- Serial communication interface RS485 MODBUS (model TTFM100-F1-NG & TTFM100-F18-NG).
- Serial communication interface RS232 (Hand-held type TTFM100B-HH-NG).

Typical Use

- Water treatment, slurry and process water pumping;
- Flow balancing;
- Hydro-electric, cooling, anti-fire stations;
- Water District;
- Oil and chemical industries;
- Extraction industries;
- Food, paper and pharmaceutical industries;
- Car industries

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TTFM100-F1-NG
Wall Mounting Stationary Type

High Accuracy Measurement	Linearity: better than 0.5% - Repeatability: better than 0.2%, - Accuracy: better than ± 1%
Data Logging	Built-in SD Card with 2Gb memory
Wide Measuring range	Several types of transducers available, measuring pipe sizes from DN15mm to DN6000mm with four different types of sensors + PT100 ohm when if used as heat meter
Menu Languages	TTFM100-F1-NG can support Italian, English or Turkish menus. German and Spanish will be implemented shortly.
Power Supply	24VDC and/or 85-264VAC
Dimensions/ Protection Grade	220mm x 179mm x 70mm IP65
Output	Relay OCT / 4-20mA / RS485
Protocol	MODBUS

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TTFM100-F18-NG
DIN RAIL Mounting Stationary Type
With Display & Keypad

High Accuracy Measurement	Linearity: better than 0.5% - Repeatability: better than 0.2%, - Accuracy: better than ± 1%
Wide Measuring range	Several types of transducers to be selected, measuring pipe sizes from DN15mm to DN6000mm with four different types of sensors + PT100 ohm when if used as heat meter
Menu Languages	TTFM100-F1-NG can support Italian, English or Turkish menus. German and Spanish will be implemented shortly.
Power Supply	12…36 VDC
Engineering Units	Flow: Imperial and metric Calories: BTU; GJ; KW; KCal
Dimensions **Protection Grade**	90 x 90 x 36mm IP20
Set-up	By integrated keypad
Output	Relay OCT / 4-20mA / RS485
Protocol	MODBUS

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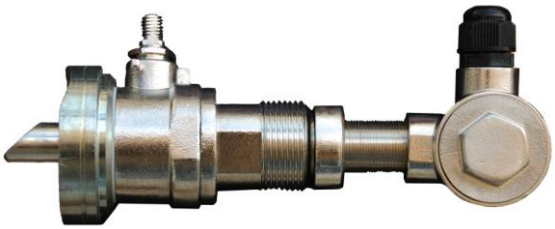
AVAILABLE ULTRASONIC SENSORS

Clamp-on Sensors – Standard Type

Temperature Range – 20…+80°C
Max Cable length: 200mt
TTS-100-TS2-NG Range: DN15…100
Working Frequency 1.5 MHz
TTS-100-TM1-NG Range: DN50…1000
Working Frequency 1 MHz
TTS-100-TL1-NG Range: DN300…6000
Working Frequency 0.6 MHz

Clamp-on Sensors
High Temperature Type

Temperature Range – 20…+160°C
Max Cable length: 200mt
TTS-100-TS1-NG-HT Range: DN15…150
TTS-100-TM1-NG-HT Range: DN50…600
Working Frequency 1 MHz



Insertion Sensor – Wetted Sensors

Max. Pressure 20 bar
Temperature Range -20 +130 °C
Max Cable length: 200mt
TTS100-B1-NG-1” (Short Type) Range: DN50…2000
TTS100-B2-NG-1” (Long Type) Range: DN50…2000
Working Frequency 1 MHz

FLANGED Sensors

Max. Pressure 16 bar depending from the DN
Temperature Range -40 + 160 °C
Max Cable length: 200mt
TTS100-BNG-DNXX

From DN50 to DN1000

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TTFM10B-HH-NG
Hand Held Type

High Accuracy Measurement	Linearity: better than 0.5% - Repeatability: better than 0.2%, - Accuracy: better than ± 1%
Wide Measuring range with Clamp-on Sensors	Three types of clamp-on sensors for size from DN15-100, DN50-10000, DN300-6000, no pressure drop, no pipe disturbance
Italian, French or English Menu	TTFM100B-HH-NG can support Italian, English, Spanish, French or Turkish menus. German will be implemented shortly.
Battery and Power Supply	3 x NIMH rechargeable battery type AA 2100 mAh for 10 hours of continuous operation. Charger 100-240 VAC adapter.
Protection Grade	IP20 handled unit; IP68 Clamp-on Sensors with BNC connectors
Output	RS232 to download the stored data by free software Hyperterminal or RS232 Data Logger
Data Logger	- Built-In 24 K Data Logger can store over 2000 lines of data. - SD card 2GB: available soon.
Standard Configuration	1 x Handled Unit; 2 x Couples of clamp-on sensors; 2 x 5 mt spiral cables for clamp-on sensors connection; 2 x Stretcher 3 mt; 1 x Data Line cable ;1 x Power Cord; 1 x Coupling Grease, 1 x Carrying Case. Optional: 2 x 10 mt cables for clamp-on sensors connection.

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LLB-PTTFM2000

Long Life Battery Portable Ultrasonic Transit Time Flow Meter

- **Measuring Flow and Pressure**
- **Battery life from 6 months to 1 year + optional battery pack**
- **GSM-GPRS Modem from remote data transmission**
- **Continuous Universal Power Supply: Battery, 12…36VDC, 110/220 VAC, Solar Panel**

High Accuracy Measurement	Linearity: better than 0.5% - Repeatability: better than 0.2%, - Accuracy: better than ± 1%
Wide Measuring range with Clamp-on Sensors	Three types of clamp-on sensors for sizes from DN15-100, DN50-1000, DN300-6000, no pressure drop, no pipe disturbance. Pressure /level sensors with range from which to choose by customers
Menu Languages	LLB-PTTFM2000-NG can support Italian, French or English menu. Other languages will be implemented
Large Capacity Battery and Power Supply	Battery Pack Primary Lithium up to 40 AH provide up to 12 months operation. Universal Charger adapter. Continuous Universal External power Supply 12 Vdc, 24 Vac, 80..260 Vac, Solar Panel
Dimensions / Weight / Protection Grade	371×258×30 mm; Weight 7 Kg, IP67 main unit, IP68 clamp-on sensors;
Input	1 Analog Input for pressure/level sensor; 1 digital input
Output	RS232/485 MODBUS MODEM GSM/GPRS QUAD BAND
Large LCD Display	2x20 Digits, displaying Instantaneous flow, Total Flow (Positive, Negative and Net), Velocity, Working Status etc.
Data Logger	Built-In 4Mbytes Data Logger and 4 Gbytes USB PEN
Standard Configuration	1 Unit; 2 Couples of clamp-on sensors; 1 Pressure sensor; 2 x 20 mt Transducers Cables; 2 mounting chains 5 mt;1 Universal Charger

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TT100-8812-NG
Ultrasonic Thickness Gauge

Measuring Range (Metric / Imperial)	1.2-225 mm / 0.05-9 Inch.
Measured Materials	Any hard materials including steel, cast iron, red copper, brass, zinc, polyethylene, PVC, and other materials
Sound Speed	500-9000 mt/sec.
Accuracy / Resolution	+/- (0.5% n + 0.1) - Calibration block included Resolution 0.1 mm
Large Capacity Battery	4x1.5 V AAA - Low battery indicator
Small Size & Light Weight	120x62x30 mm; Weight 164 g without battery
Low Limit Steel Pipe	15 x 2.0 mm
Output	RS232 interface
Display	4 Digits LCD
Configuration / Set-up	By Friendly Push Button Key Pad

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